

LISTING OF CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) An objective lens drive apparatus configured to be used in an optical pickup, comprising:

a magnetic circuit comprising first and second magnets separated from one another by a single gap, the first and second magnets providing a magnetic field relative to said single gap;

a coil unit comprising a single laminate structure including plural printed circuit boards each containing at least one coil of a plurality of coils, the laminate structure being disposed for operative interaction with the magnetic field of the single gap, said single laminate structure plurality of coils including at least one focus coil configured to provide focusing movement of the single laminate structure due to current in the at least one focus coil interacting with the magnetic field of said single gap, at least one tracking coil configured to provide tracking movement of the single laminate structure different from the focusing movement due to current in the at least one tracking coil interacting with the magnetic field of said single gap, and at least one plural tilt coil provided together on one of the plural printed circuit boards, the plural tilt coils being configured to provide inclination adjusting tilting movement of the single laminate structure different from the focusing movement and the tracking movement due to current in the at least one plural tilt coil interacting with the magnetic field of said single gap; and

an objective lens connected to the single laminate structure such that movement of the laminate structure results in a corresponding movement of the objective lens, the objective lens disposed outside of the single gap in which the laminate structure is disposed.

2. (Currently amended) The objective lens drive apparatus according to claim 1, wherein the at least one tracking coil and the plural tilt coils are separately disposed on different ones of the plural printed magnetic circuit comprises pairs of magnets boards.

3. (Currently Amended) The objective lens drive apparatus according to claim 1, wherein the ~~coil unit single laminate structure comprises a plurality of printed circuit boards, and the~~ at least one focus coil[[],] and the at least one tracking coil[[],] ~~and the~~ ~~at least one tilt coil~~ are separately disposed on different ones of the plural printed circuit boards.

4. (Currently Amended) The objective lens drive apparatus according to claim 1, wherein the ~~coil unit single laminate structure plural printed circuit boards include comprises~~ a plurality of alternating first and second integrated printed circuit boards, and the at least one focus coil and the at least one tracking coil are disposed on the plurality of first printed circuit boards and the at least one plural tilt coil coils is are disposed on the plurality of second printed circuit boards.

5. (Currently Amended) The objective lens drive apparatus according to claim 1, wherein the coil unit single laminate structure comprises a plurality of alternating first and second printed boards, and the at least one focus coil pattern and the at least one plural tilt coil coils are mounted on the plurality of first printed circuit boards and the at least one tracking coil is mounted on the plurality of second printed circuit boards.

6. (Previously presented) The objective lens drive apparatus according to claim 1, wherein the coil unit comprises only one focus coil, an even number of tracking coils, and

two tilt coils, and wherein the magnets are configured to be magnetized in two polarities in a focus adjustment direction.

7. (Previously presented) The objective lens drive apparatus according to claim 1, wherein the coil unit comprises an even number of focus coils, only one tracking coil, and two tilt coils, and wherein the magnets are configured to be magnetized in two polarities in a tracking adjustment direction.

Claims 8-21 (Canceled).

22. (Withdrawn) An objective lens drive apparatus configured to be used in an optical pickup to detect the inclination of an optical disk to adjust the inclination of a lens in accordance with an inclination signal of the optical disk, comprising:

a magnetic circuit comprising first and second magnets separated from one another by a gap the first and second magnets providing a magnetic field relative to said gap;

a coil unit comprising a laminate structure disposed in the gap including a plurality of focus coils configured to provide focus adjusting movements of the laminate structure due to current in the plurality of focus coils interacting with the magnetic field of said gap and at least one tracking coil configured to provide tracking adjusting movements of the laminate structure different from the focusing adjustment movements due to current in the at least one tracking coil interacting with the magnetic field of said gap; and

an objective lens connected to the laminate structure such that movement of the laminate structure results in a corresponding movement of the objective lens, the objective lens disposed outside of the gap in which the laminate structure is disposed,

wherein the focus adjusting movements of the objective lens connected to the laminate structure is responsive to a sum of drive forces generated in relative to the plurality of focus coils in response to respective currents supplied to the plurality of focus coils interacting with the magnetic field of the gap; and

wherein inclination adjustment of the objective lens is configured to be executed by generating a moment around a center of gravity of a movable part due to a difference between the drive forces to provide inclination adjusting movements different from the focus adjusting movements and the tracking adjusting movements.

23. (Withdrawn) The objective lens drive apparatus according to claim 22, wherein the magnetic circuit comprises pairs of magnets.

24. (Withdrawn) The objective lens drive apparatus according to claim 22, wherein the coil unit comprises a plurality of printed circuit boards, and the plurality of focus coils and the at least one tracking coil are separately disposed on the printed circuit boards.

25. (Withdrawn) The objective lens drive apparatus according to claim 22, wherein the coil unit comprises a printed circuit board, and the plurality of focus coils and the at least one tracking coil are disposed on the printed circuit board.

26. (Withdrawn) The objective lens drive apparatus according to claim 22, wherein the coil unit comprises an even number of focus coils and only one tracking coil and the magnets are configured to be magnetized in two polarities in a tracking direction.

27. (Withdrawn) An objective lens drive apparatus configured to be used in an optical pickup to detect the inclination of an optical disk to adjust the inclination of a lens in accordance with an inclination signal of the optical disk, comprising

a magnetic circuit comprising first and second magnets separated from one another by a gap the first and second magnets providing a magnetic field relative to said gap;

a coil unit comprising a laminate structure disposed in the gap including at least one focus coil configured to provide focus adjusting movements of the laminate structure due to current in the at least one focus coil interacting with the magnetic field of said gap, a plurality of tracking coils configured to provide tracking adjusting movements of the laminate structure different from the focusing adjustment movements due to current in the plurality of tracking coils interacting with the magnetic field of said gap; and

an objective lens connected to the laminate structure such that movement of the laminate structure results in a corresponding movement of the objective lens, the objective lens disposed outside of the gap in which the laminate structure is disposed

wherein the tracking adjusting movements of the objective lens connected to the laminate structure are responsive to a sum of drive forces generated in relative to the plurality of focus tracking coils in response to respective currents supplied to the plurality of tracking coils interacting with the magnetic field of the gap; and

wherein inclination adjustment of the objective lens is configured to be executed by generating a moment around a center of gravity of a movable part due to a difference between the drive forces to provide inclination adjusting movements different from the focus adjusting movements and the tracking adjusting movements.

28. (Withdrawn) The objective lens drive apparatus according to claim 27, wherein the magnetic circuit comprises pairs of magnets.

29. (Withdrawn) The objective lens drive apparatus according to claim 27, wherein the coil unit comprises a plurality of printed circuit boards, and the at least one focus coil and the plurality of tracking coils are separately disposed on the printed circuit boards.

30. (Withdrawn) The objective lens drive apparatus according to claim 27, wherein the coil unit comprises a printed circuit board, and the at least one focus coil and the plurality of tracking coils are mounted on the printed circuit board.

31. (Withdrawn) The objective lens drive apparatus according to claim 27, wherein the coil unit comprises only one focus coil and there are an even number of tracking coils, and the magnets are configured to be magnetized in two polarities in a focus direction.

Claims 32-41 (Canceled).

42. An objective lens drive apparatus configured to be used in an optical pickup, comprising:

a magnetic circuit comprising first and second ~~magnets~~ magnetic poles of opposite polarity separated from one another [[by]] in a manner to form a single gap, the first and second ~~magnets~~ magnetic poles providing a magnetic field in said single gap;

a coil unit comprising a single laminate structure disposed within the single gap and including plural coils formed on plural circuit boards, the plural coils including at least one focus coil configured to provide focus adjusting movement of the single laminate structure due to current in the at least one focus coil interacting with the magnetic field of said single gap, at least one tracking coil configured to provide tracking adjusting movement of the

single laminate structure different from the focusing adjustment movement due to current in the at least one tracking coil interacting with the magnetic field of said gap, and ~~at least one plural tilt coil coils contained together on one of the plural printed circuit boards, the plural tilt coils being~~ configured to provide inclination adjusting tilting movement of the single laminate structure different from the focusing adjustment movement and the tracking adjustment movement due to current in the ~~at least one plural tilt coil coils~~ interacting with the magnetic field of said single gap; and

a lens provided in a lens holder and connected with the single laminate structure to be moved therewith, the lens disposed outside of the gap.

Claims 43-48 (Canceled).

49. (Currently Amended) The objective lens drive apparatus according to claim 1, wherein the at least one focus coil and the plural[[,]] ~~tilt[,,] and tracking coils~~ are separately disposed on [[a]] different ones of the plural plurality of circuit boards[,,] ~~the plurality of circuit boards forming the laminate structure with one another.~~

Claim 50. (Canceled).

51. (Withdrawn) The objective lens drive apparatus according to claim 22, wherein the focus coils and at least one tracking coil are disposed on a plurality if circuit boards, the plurality of circuit boards forming the laminate structure with one another.

52. (Withdrawn) The objective lens drive apparatus according to claim 22, wherein only one laminate structure including the focus coils and at least one tracking coil is disposed in the gap.

53. (Withdrawn) The objective lens drive apparatus according to claim 27, wherein the at least one focus coil and the tracking coils are disposed on a plurality of circuit boards, the plurality of circuit boards forming the laminate structure with one another.

54. (Withdrawn) The objective lens drive apparatus according to claim 27, wherein only one laminate structure including the at least one focus coil and the tracking coils is disposed in the gap.

55. (Currently Amended) The objective lens drive apparatus according to claim 42, wherein the at least one focus coil[[,]] tilt[,,] and at least one tracking eoils coil are separately disposed on different ones of the [[a]] plurality of circuit boards[,,] ~~the plurality of circuit boards forming the laminate structure with one another.~~

56. (Currently Amended) The objective lens drive apparatus according to claim 42, wherein only one laminate structure including the focus, tracking, and tilt coils is disposed in the gap and coupled with the lens holder with three pairs of conductive elastic members being configured to have one conductive elastic member of each pair connected to one side of the one laminate structure and the second conductive elastic member of each pair connected to a side of the one laminate structure opposite to the one side, with each pair of elastic conductive members configured to provide elastic support for the one laminate structure and

Application No. 09/903,752

Reply to Office Action of 08/10/2007

coupled the lens holder while supplying current exclusively to only one of the focus, tracking, and tilt coils.